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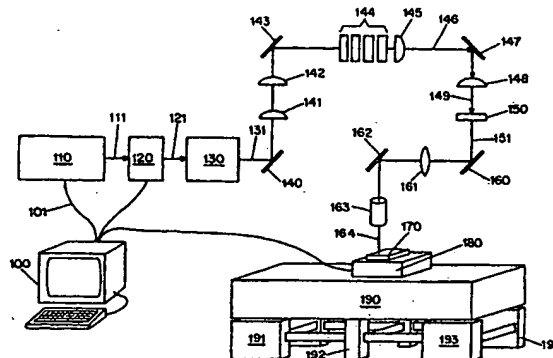
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- (54) Title: SYSTEMS AND METHODS USING SEQUENTIAL LATERAL SOLIDIFICATION FOR PRODUCING SINGLE OR POLYCRYSTALLINE SILICON THIN FILMS AT LOW TEMPERATURES**



(57) **Abstract:** System and methods for processing an amorphous silicon thin film sample into a single or polycrystalline silicon thin film are disclosed. The system includes an excimer laser (110) for generating a plurality of excimer laser pulses (111) of a predetermined fluence, an energy density modulator (120) for controllably modulating fluence of the excimer laser pulses, a beam homogenizer (144) for homogenizing modulated laser pulses (146) in a predetermined plane, a mask (150) for masking portions of the homogenized modulated laser pulses into patterned beamlets, a sample stage (180) for receiving the patterned beamlets to effect melting of portions of any amorphous silicon thin film sample (170) placed thereon corresponding to the beamlets, translating means for controllably translating a relative position of the sample stage with respect to a position of the mask and a computer (100) for controlling the controllable fluence modulation of the excimer laser pulses and the controllable relative positions of the sample stage and mask, and for coordinating excimer pulse generation and fluence modulation with the relative positions of the sample stage and mask, to thereby process amorphous silicon thin film sample into a single or polycrystalline silicon thin film by sequential translation of the sample stage relative to the mask and irradiation of the sample by patterned beamlets of varying fluence.

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